Attorney Docket No. 2240-7141 PATENT

What is claimed is:

Sub A1 102 Barker

nuclear radiation

EM radiation

1. A method of detecting electromagnetic and/or nuclear radiation, comprising the steps of:

exposing a cantilever to a source of radiation, the cantilever having at least one physical property affected by radiation;

monitoring radiation-induced changes in the at least one physical property; and

correlating changes in the at least one physical property to a measure of radiation.

2. A method according to claim 1, wherein the monitoring step includes monitoring radiation-induced bending of the cantilever.

3. A method according to claim 1, wherein the monitoring step includes monitoring radiation-induced changes in mechanical resonance of the cantilever.

Sub B2

same as cantilever of claim 1

4. A method according to claim 1, further comprising forming a microcantilever using a material or materials which heat when exposed to radiation, changes in the at least one physical property of the microcantilever being temperature dependent, and the monitoring step comprises monitoring temperature-dependent changes in the at least one physical property of the microcantilever.

Sub A27

see above

5. A method according to claim 1, further comprising forming a microcantilever using a material or materials which absorb radiation and changes property as a function of absorbed radiation, and the monitoring step includes monitoring stress-induced changes in the microcantilever and the correlating step includes correlating changes in stress to the presence of radiation.

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a2 Cnt.

6. A method according to claim 1, wherein the microcantilever has an elastic modulus which varies with exposure to radiation, the at least one mechanical property of the microcantilever varying with variations in the elastic modulus.

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7. A method according to claim ~~1~~ 25, further comprising the step of applying at least one coating to the microcantilever made of a material which interacts with radiation to vary at least one physical property of the microcantilever, the exposing step comprising exposing the coated microcantilever to radiation, and the correlating step includes correlating changes in the at least one physical property to the presence of the radiation.

Sub A3

8. A method according to claim 1, further comprising the steps of directing a laser beam from a diode laser toward the cantilever, reflecting the laser beam from the cantilever, receiving the reflected laser beam at a position sensitive detector which generates a PSD signal, and detecting radiation based on the PSD signal.

spell out

9. A method according to claim 1, further comprising coating the cantilever with or fabricating the cantilever from a piezoresistive material which has a resistivity which varies with bending of the microcantilever, and the correlating step comprises correlating changes in resistivity of the piezoresistive material to the presence of radiation.

nab

sub D2

nab

10. A method according to claim 1, further comprising placing the microcantilever in a capacitor having a capacitance which varies with movement of the microcantilever, and the correlating step includes correlating changes in capacitance to the presence of radiation.

11. A method according to claim ~~2~~ 25, further comprising forming an array of microcantilevers and the exposing step includes exposing the array of microcantilevers to radiation.

12. A method according to claim ~~1~~ 25, further comprising coating the microcantilever with a material which produces a bimetallic effect and thus bending of the microcantilever when heated, the exposing step comprises exposing the microcantilever to a radiation which induces heating and thus bending of the microcantilever, and the correlating step comprises correlating bending of the microcantilever to the presence of radiation.

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13. A method according to claim ~~1~~ 25, further comprising oscillating the microcantilever, determining the microcantilever resonance properties, and detecting radiation based on changes in the resonance response.

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14. A method according to claim ~~1~~ 25, further comprising mechanically oscillating the microcantilever using a piezoelectric device attached to the microcantilever, determining the microcantilever resonance properties, and detecting radiation based on changes in the resonance response.

F

15. A method according to claim ~~1~~ 25, further comprising mechanically oscillating the microcantilever using electrical stimulation to a piezoresistive coating attached to the microcantilever, determining the microcantilever resonance properties, and detecting radiation based on changes in the resonance response.

Sub a4
nub

16. A method according to claim 1, further comprising placing the microcantilever within an oscillatory tank circuit, wherein the cantilever is disposed between poles of a capacitor or constitutes one pole of a capacitor, mechanically oscillating the microcantilever using electrostatic forces generated within the capacitor, determining the microcantilever resonance properties, and detecting radiation based on change in the resonance response.

nuclear radiation
in EM radiation

17. An apparatus for detecting electromagnetic and nuclear radiation, comprising the steps of:

a radiation sensor having an element exposed to a source of radiation, the sensor having at least one physical property affected by radiation;

means for monitoring radiation-induced changes in the at least one physical property of the sensor; and

means for correlating changes in the at least one physical property to a measure of radiation.

Sub F1 >

18. An apparatus according to claim 17, wherein the sensor comprises a microcantilever connected to a base, where the microcantilever consists of a material or layered materials which converts energy of radiation, if present, into a physical change in the microcantilever.

Sub 95 >

19. An apparatus according to claim 18, wherein the microcantilever is comprised of at least one coating, where the at least one coating includes a first metallic coating which, together with the microcantilever, exhibits a bimetallic effect when exposed to energy of radiation.

Sub F3 >

20. An apparatus according to claim 19, wherein the first metallic coating covers a portion of one surface of the microcantilever and is separated from the base by a space.

Sub 96 >

21. An apparatus according to claim 19, wherein the first metallic coating covers a portion of one surface of the microcantilever and

is separated from the base by an insulator.

a6
no 1st coating in parent claim
Cont.

22. An apparatus according to claim 18, further comprising a second coating on the microcantilever, consisting of a radiation absorbing material that increases the radiation flux absorbed by the microcantilever.

Sub F6

23. An apparatus according to claim 18, wherein the microcantilever or layered material on the microcantilever exhibits a change in chemical or physical properties upon absorption of radiation.

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24. An apparatus according to claim 18, wherein the microcantilever or layered material on the microcantilever exhibits a change in elastic modulus upon radiation damage induced by absorption of nuclear radiation.

25. An apparatus according to claim 17, further comprising a reference sensor of substantially similar construction and local environment and located in proximity to the radiation sensor, but not exposed to radiation, whereby a differential response between the reference sensor and the radiation sensor provides a calibration that reduces extraneous environmental factors common to both assemblies.

26. A sensor for detecting radiation, comprising:

a cantilever substrate coupled to a base; and

a metal film bonded in confronting relationship to the cantilever substrate.

27. A sensor according to claim 26, further comprising:

a thermally-absorptive film in confronting relationship with the metal film for increasing the radiation flux absorbed by the metal film.

28. A sensor according to claim 26, wherein the cantilever substrate is coated with a piezoresistive material.

29. A sensor according to claim 26, further comprising a stress-sensitive coating bonded in confronting relationship to the cantilever substrate.

30. A sensor according to claim 26, wherein the cantilever substrate is made of a semiconductor material selected from the group consisting of silicon and silicon nitride.

31. A sensor according to claim 26, wherein the sensor assembly is disposed in an array of substantially similar sensor assemblies.

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